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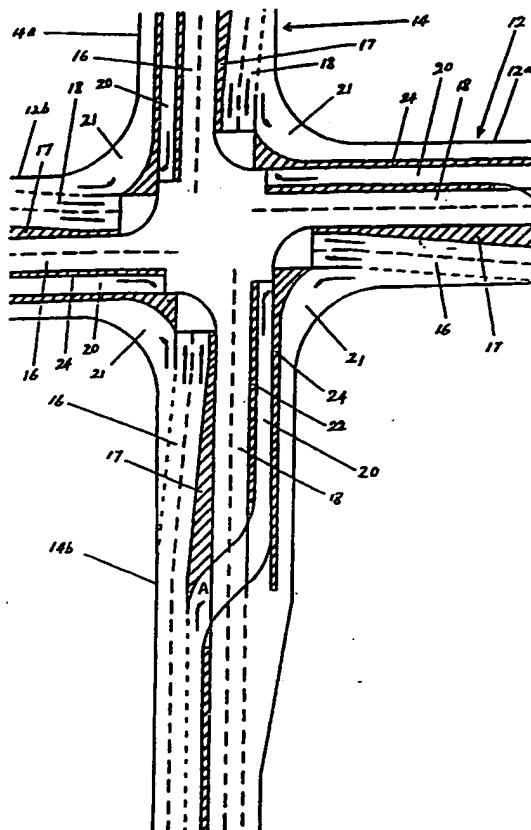
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(21) International Application Number: PCT/AU92/00106 (22) International Filing Date: 11 March 1992 (11.03.92) (30) Priority data: PK 5593 15 April 1991 (15.04.91) AU (71)(72) Applicant and Inventor: CHAU, Hau, Dan [AU/AU]; 2 William Street, Footscray, VIC 3011 (AU). (74) Agent: WILSON, Stephen, Henry; Griffith Hack & Co., 601 St. Kilda Road, Melbourne, VIC 3004 (AU). (81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent), US.	Published <i>With international search report.</i>
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(54) Title: ROAD AND TRAFFIC CONTROL SYSTEM

(57) Abstract

A traffic control system is provided for improving the flow of traffic through an intersection. The control system utilizes traffic control signals which have only two phases and a turn lane (20) which extends from a traffic lane (16) across an oncoming lane (18) and then to the intersection so that traffic can queue up in the right turn lane (20) and make a right-hand turn when a green go signal is given without interfering with the oncoming traffic.



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ROAD AND TRAFFIC CONTROL SYSTEM

This invention relates to a road and traffic control system and, in particular, to a road and traffic control system for controlling the movement of traffic at a 5 road intersection.

As is well known, traffic intersections are normally controlled by traffic lights which have a number of phases per cycle. In heavy traffic areas it is conventional for the traffic lights to have four control 10 phases per cycle. The four control phases comprise a first phase where one of the roads in an intersection is given a green light to enable traffic to cross the intersection, a second phase where traffic on that road is given a turn

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light to enable the traffic to make a turn in front of the oncoming traffic, a third phase where the intersecting road is given a green light to enable traffic to cross the intersection and a fourth phase where the traffic on the 5 intersecting road is enabled to make a turn across the oncoming traffic.

The need to provide four control phases increases the cycle time of the lights and also means that if a vehicle is required to stop at the intersection it is 10 necessary for the vehicle to wait for the completion of up to three phases of the cycle before being able to cross the intersection or make a turn through the intersection.

The object of this invention is to provide a road and traffic control system which reduces the required 15 number of control phases and therefore the delay faced by vehicles at controlled intersections.

The invention provides a road and traffic control system comprising:

a first carriageway and a second carriageway 20 forming a road intersection, the first carriageway having a first road portion and a second road portion on respective sides of the intersection and the second carriageway having at least a first road portion on another side of the intersection;

25 the first and second road portions of the first and second carriageways having at least one lane for enabling traffic to travel in a first direction and at least one other lane for enabling traffic to travel in the opposite direction;

30 at least said first road portion of the first carriageway having a turn lane which communicates with said one lane of the first road portion at a location spaced from said intersection so that vehicles can enter said turn lane from said one lane before arriving at said 35 intersection, said turn lane crossing over said at least one other lane of the first road portion and extending to said intersection; and

traffic control means at said intersection having

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two control phases for stopping vehicles on the first carriageway and allowing vehicles to travel through the intersection from the second carriageway and a second phase for allowing vehicles to travel through the intersection 5 from the first carriageway and stopping vehicles from travelling through the intersection from the second carriageway.

According to the present invention, since turning vehicles can enter the turn lane prior to reaching the 10 intersection the vehicles can queue up to make a turn in the turn lane and all that is needed is for the traffic control system to have two cycles so that when the cycle allows the traffic to enter the intersection vehicle are able to go straight through the intersection to continue on 15 the carriageway and also to make a turn from the turn lane into the other carriageway. Since the turning vehicles have already crossed vehicles which will form oncoming traffic and wish to pass through the intersection and travel on the at least one another lane the vehicles in the 20 turning lane can make their right-hand turn without interfering with the oncoming traffic. Thus, it is not necessary to provide turn phases in the traffic control cycle and therefore only two phases are required for each 25 cycle of the traffic control signals.

In one embodiment of the invention the first and second carriageways form a cross-road having the road intersection and the second carriageway has a second road portion, each of the first and second road portions of the first carriageway and each of the first and second road 30 portions of the second carriageway have a respective said turn lane.

In another embodiment of the invention the first carriageway and second carriageway form a T intersection and only the first road portion of the first carriageway 35 includes the turn lane.

Preferably the system includes a second turn lane which extends from the at least one first lane of one of the road portions of one of the carriageways to the at

least one other lane of one of the road portions of the other carriageway and wherein said other turn lane merges with said at least one other lane past the position where said at least one lane communicates with said turn lane so 5 that vehicles using said second turn lane do not have to travel over the position where the turn lane crosses said at least one other lane.

Preferably the first and second road portions include a plurality of first lanes and a plurality of other 10 lanes.

Preferably said turn lane runs parallel with said at least one other lane and is separated from at least one other lane by a traffic barrier.

Preferably said second turn lane runs 15 substantially parallel to said turn lane and is separated from said turn lane by a traffic barrier.

Preferably the traffic barriers comprise traffic islands.

A preferred embodiment of the invention will be 20 described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a traffic intersection utilizing a conventional control system;

Figures 1a, 1b, 1c and 1d are diagrams 25 representing four phases of a cycle used in the conventional system;

Figure 2 is a view of an intersection utilizing the control system of one embodiment of this invention;

Figures 2a and 2b are diagrams showing the two 30 phases of a control cycle according to the embodiment of figure 2;

Figure 3 is a view of a second embodiment of the invention;

Figures 3a and 3b show the two phases of the 35 control cycle according to figure 3;

Figure 4 is a view showing a further embodiment of the invention;

Figures 4a and 4b are diagrams showing the two

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phases according to the embodiment of the invention in figure 4;

Figure 5 is a view of a still further embodiment of the invention; and

5 Figures 5a and 5b are diagrams showing the two phases of the control system according to figure 5.

The preferred embodiment of this invention will be described with reference to a road system in which traffic travels on the left-hand side of the road.

10 However, it should be understood that the invention could be practised with traffic which travels on the right-hand side of the road.

With reference to figure 1, a conventional intersection is shown which includes traffic control 15 signals which, as is conventional, are generally in the form of traffic lights 10. The intersection is formed by two carriageways 12 and 14 which each have first and second road portions 12a and 12b and 14a and 14b respectively.

The road portions 12a and 12b may include turn lanes for 20 enabling traffic to turn left or right.

As is conventional, the traffic lights 10 have four control phases in each cycle and the control phases are shown in figures 1a to 1d. The first phase as shown in figure 1a allows traffic to travel through the intersection 25 on carriageway 12 and to make left-hand turns but does not allow traffic to make right-hand turns. The second phase as shown in figure 1b allows traffic to make a right-hand turn from the carriageway 12 into the carriageway 14 and also to make left-hand turns from the carriageway 14 into 30 the carriageway 12 but prevents traffic from passing through the intersection from the road portion 12a to the road portion 12b of the carriageway 12 and from the road portion 14a to the road portion 14b on the carriageway 14. The third cycle as shown in figure 1c allows traffic to 35 pass through the intersection on the carriageway 14 and also to make a left-hand turn from the carriageway 14 into the carriageway 12. The fourth cycle enable traffic to make a right-hand turn from the carriageway 14 into the

carriageway 12 and also to make a left-hand turn from the road portion 12a to the road portion 14b and from the road portion 12b to the road portion 14a.

Thus, in order to complete a full cycle four phases are required and if a vehicle is required to stop at the intersection the vehicle may have to wait up to three phases before being able to continue. This increases delay, traffic congestion and also makes it more difficult to provide a smooth flow of traffic.

A first embodiment of the invention is shown in figures 2, 2a and 2b and generally comprises carriageways 12 and 14 which form an intersection as shown and which are comprised of road portions 12a and 12b and 14a and 14b respectively on either side of the intersection. Each of the road portions 12a, 12b and 14a and 14b have a plurality of lanes 16 for enabling traffic to flow in one direction and a plurality of lanes 18 for enabling traffic to flow in the opposite direction. The lanes 16 and 18 are separated by a traffic island or like 17.

The intersection shown in figure 2 is controlled by traffic control lights (which are not shown) and which have two phases in each cycle as will be described hereinafter.

The system includes a right-hand turn lane which communicates with the first lanes 16 at position A prior to the intersection formed by the road 12 and 14. The right-hand turn lane 20 crosses over the lanes 18 for oncoming traffic and extends substantially parallel to the lanes 18 and is separated from the lanes 18 by a traffic barrier 22. Traffic wishing to make a right-hand turn from road portion 14b into road portion 12a enters the right-hand turn lane 20 prior to the intersection at position A and cross over the oncoming lanes 18. If the traffic control lights at the intersection are set to stop traffic on carriageway 14 the vehicles can merely queue up in the right-hand turn lane 20 at the intersection. The fact that the traffic lights are already stopping traffic from moving on the carriageway 14 means that little or no

traffic will be on the lanes 18 of the road portion 14b thereby making it easy for vehicles to turn from the lane 16 of road portion 14b across lanes 18 into the right-hand turn lane 20. If traffic is travelling on the lanes 18 5 then vehicles wishing to enter the turn lane 20 from the lane 16 of road portion 14b must give way to that traffic and wait for the road to clear so that they can safely make their turn into the right-hand turn lane 20.

When the traffic lights turn green to enable 10 traffic to travel on the carriageway 14 through the intersection, the traffic in the lane 16 which wishes to go straight ahead can travel across the intersection into the lane 16 on road portion 14a and the traffic which is in the right-hand turn lane 20 wishing to make the right-hand turn 15 can simply make the right-hand turn into the lanes 18 of the road portion 12a. The traffic in the lanes 18 of the road portion 14a wishing to go straight ahead can merely travel straight ahead into the lanes 18 without interfering with the right turning traffic from the right-hand turn 20 lane 20. Traffic wishing to make a left-hand turn from the lanes 16 of road portions 14b or lanes 18 of road portion 14a simply make their left-hand turns in the left-hand exits 21 obeying the normal traffic laws for right and left-hand turns which are in existence.

25 Thus, in order to provide for traffic which wishes to travel straight ahead on the intersecting carriageways and also wishing to make a right-hand turn only a two phase control signal is required. Thus, the delay time for traffic is less and traffic is therefore 30 able to flow more smoothly.

Similarly, traffic wishing to make a right-hand turn from the road portions 14a enters a similar right-hand turn lane 20 in order to make its right-hand turn.

The carriageway 12 also includes similar 35 right-hand turn lanes 20 for enabling traffic to make a right-hand turn when the traffic control signals are green to enable traffic to flow through the intersection on carriageway 12.

Figures 2a and 2b show diagrammatically the two cycles. The first cycle shown in figure 2a allows traffic to flow straight ahead through the intersection on carriageway 14 and to make a right-hand turn from carriageway 14 into carriageway 12 via the right-hand turn lanes 20 on the road portions 14a and 14b. Traffic is also able to make a left-hand turn from each of the road portions 12a, 12b, 14a and 14b.

The second control phase is shown in figure 2b and merely is a change from a green go signal on carriageway 14 and a red stop signal on carriageway 12 to a green go signal on carriageway 12 and a red stop signal on carriageway 14. This enables the traffic on carriageway 12 to proceed through the intersection and also to make right-hand turns from the road portions 12b to the road portion 14b and from the road portion 12a to the road portion 14a using the right-hand turn lanes 20. Once again, left-hand turns can be made from all road portions as described above.

In the preferred embodiment of the invention the left-hand turn lanes 21 can be separated from the right-hand turn lanes 20 by a traffic barrier 24 which can be in the form of a traffic island. As is best seen in figure 2, the right-hand turn lanes 20 run generally parallel to the oncoming lanes 18 after they cross the oncoming lanes and the left-hand turn lanes 21 run generally parallel to the right-hand turn lanes 20 and merge with the oncoming lanes 18 past the point where the right-hand turn lanes 20 communicate with the lane 16. Thus, traffic doing a left-hand turn will not need to cross over traffic doing a right-hand turn or interfere with that traffic. The left-hand turn lane 21 simply merges into the oncoming lanes 18 past the point where the right-hand turn lane 20 crosses over the oncoming lanes 18.

A further embodiment of the invention is shown in figure 3. This embodiment uses similar reference numerals to figure 2 to designate the same road portions and lanes. This embodiment has particular application where space may

be a minimum and there may not be sufficient room to provide a left-hand turn lane 21. In this embodiment left-hand turn lane 21 is omitted and traffic makes a left-hand turn only when a green signal is provided. The 5 two phase cycle in this embodiment is shown in figures 3a and 3b and in figure 3a a green light is provided for the carriageway 14 to enable traffic to travel through the intersection on carriageway 14 and also to make a right-hand turn via right-hand turn lane 20 from the road 10 portions 14a and 14b into the road portions 12b and 12a respectively. Left-hand turns can only be made from the road portions 14a and 14b once again observing the normal road laws which exist for right and left-hand turning traffic.

15 Figure 3b shows the other phase of the cycle when traffic on carriageway 14 is stopped and traffic on carriageway 12 is provided with the green go signal. Traffic on the carriageway 12 is able to pass through the intersection and also make a right-hand turn from road 20 portion 12b to road portion 14b and from road portion 12a to road portion 14a via right-hand turn lanes 20. Left turning traffic is only allowed from road portion 12b to road portion 14a and from road portion 12a to road portion 14b once again obeying the required laws for right and 25 left-hand turning traffic.

In this embodiment the left-hand turning traffic turns across the right-hand turn lanes 20 which are stopped by a red signal into the lanes 16 or 18 as the case may be of the other carriageway. Separate left-hand turn lanes 30 are not provided.

Figure 4 shows an embodiment which is applicable where only a very narrow intersection is possible. The two control phases in this embodiment are the same as in the embodiment of figure 3 and once again similar reference 35 numerals as shown in figures 2 and 3 represent the same lanes and roadway portions as in figures 2 and 3.

Figure 5 shows an embodiment of the invention applicable to a T-junction and in this embodiment of the

invention only the road portion 12b is provided with the right-hand turn lane 20. Right turns from the road portion 14b are made in the conventional manner and, of course, right-hand turns from the road portion 12a are impossible.

- 5 Figures 5a and 5b show control phase diagrams. When the traffic control signals are green for carriageway 14 traffic is able to make a left-hand turn into road portion 12b or a right-hand turn into road portion 12a and also traffic is able to make left-hand turn from road
10 portion 12a into road portion 14b. When the traffic control signal changes so that the carriageway 12 is provided with a green signal traffic can pass through the intersection on carriageway 12 and also make a right-hand turn from right-hand turn lane 20 into carriageway 14b.
15 Once again, left-hand turns can be made from carriageway 12 to carriageway 14b with the turning traffic obeying the normal traffic laws for right and left-hand turning traffic.

The preferred embodiments of the invention
20 therefore provide a road and traffic control system which requires only a two-phase control per cycle for traffic lights. Some (or all) of the right-hand turning vehicles are able to cross opposing flow of traffic before reaching the intersection and queue up on the right-hand side of the
25 road. Once the traffic lights turn green the traffic queuing can make a right-hand turn straight away into the other carriageway without having to wait or give way to the opposing flow of traffic. This will eliminate the need of right-hand turn traffic light control phases at the
30 intersection.

The system according to the preferred embodiment has the advantages compared with conventional systems (on the assumption of the average effective green time for every phase of the current and new design being equal) of:
35 1) doubling traffic flow capacity at the intersection; traffic can cross the intersection at each alternative traffic light control phase instead of one of every four traffic light control phases.

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2) reduce waiting period by two-thirds; traffic queuing up at the intersection will only wait for the next traffic light control phase instead of the next three traffic light control phases.

5 3) better traffic distribution on the road; all roads will have traffic flowing away from the intersection at all times regardless of the traffic light control phase.

From the above advantages, effectively a two lane road of a two phase system will have a capacity equivalent
10 of up to a four lane road. This will reduce the cost of road construction and maintenance.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A road and traffic control system comprising:
a first carriageway and a second carriageway
forming a road intersection, the first carriageway having a
first road portion and a second road portion on respective
sides of the intersection and the second carriageway having
at least a first road portion on another side of the
intersection;

the first and second road portions of the first
and second carriageways having at least one lane for
enabling traffic to travel in a first direction and at
least one other lane for enabling traffic to travel in the
opposite direction;

at least said first road portion of the first
carriageway having a turn lane which communicates with said
one lane of the first road portion at a location spaced
from said intersection so that vehicles can enter said turn
lane from said one lane before arriving at said
intersection, said turn lane crossing over said at least
one other lane of the first road portion and extending to
said intersection; and

traffic control means at said intersection having
two control phases for stopping vehicles on the first
carriageway and allowing vehicles to travel through the
intersection from the second carriageway and a second phase
for allowing vehicles to travel through the intersection
from the first carriageway and stopping vehicles from
travelling through the intersection from the second
carriageway.

2. The system according to claim 1 wherein the first
and second carriageways form a cross-road having the road
intersection and the second carriageway has a second road
portion, each of the first and second road portions of the
first carriageway and each of the first and second road
portions of the second carriageway have a respective said
turn lane.

3. The system according to claim 1 wherein the first
carriageway and second carriageway form a T intersection

and only the first road portion of the first carriageway includes the turn lane.

4. The system of any one of claims 1 to 3 wherein the system includes a second turn lane which extends from the at least one first lane of one of the road portions of one of the carriageways to the at least one other lane of one of the road portions of the other carriageway and wherein said other turn lane merges with said at least one other lane past the position where said at least one lane communicates with said turn lane so that vehicles using said second turn lane do not have to travel over the position where the turn lane crosses said at least one other lane.

5. The system of any one of claims 1 to 4 wherein the first and second road portions include a plurality of first lanes and a plurality of other lanes.

6. The system of any one of claims 1 to 5 wherein said turn lane runs parallel with said at least one other lane and is separated from at least one other lane by a traffic barrier.

7. The system of claim 6 wherein said second turn lane runs substantially parallel to said turn lane and is separated from said turn lane by a traffic barrier.

8. The system of claim 7 wherein the traffic barriers comprise traffic islands.

9. A road and traffic control system substantially as hereinbefore described with reference to figures 2, 2a and 2b or figures 3, 3a and 3b or figures 4, 4a and 4b or figures 5, 5a and 5b of the accompanying drawings,

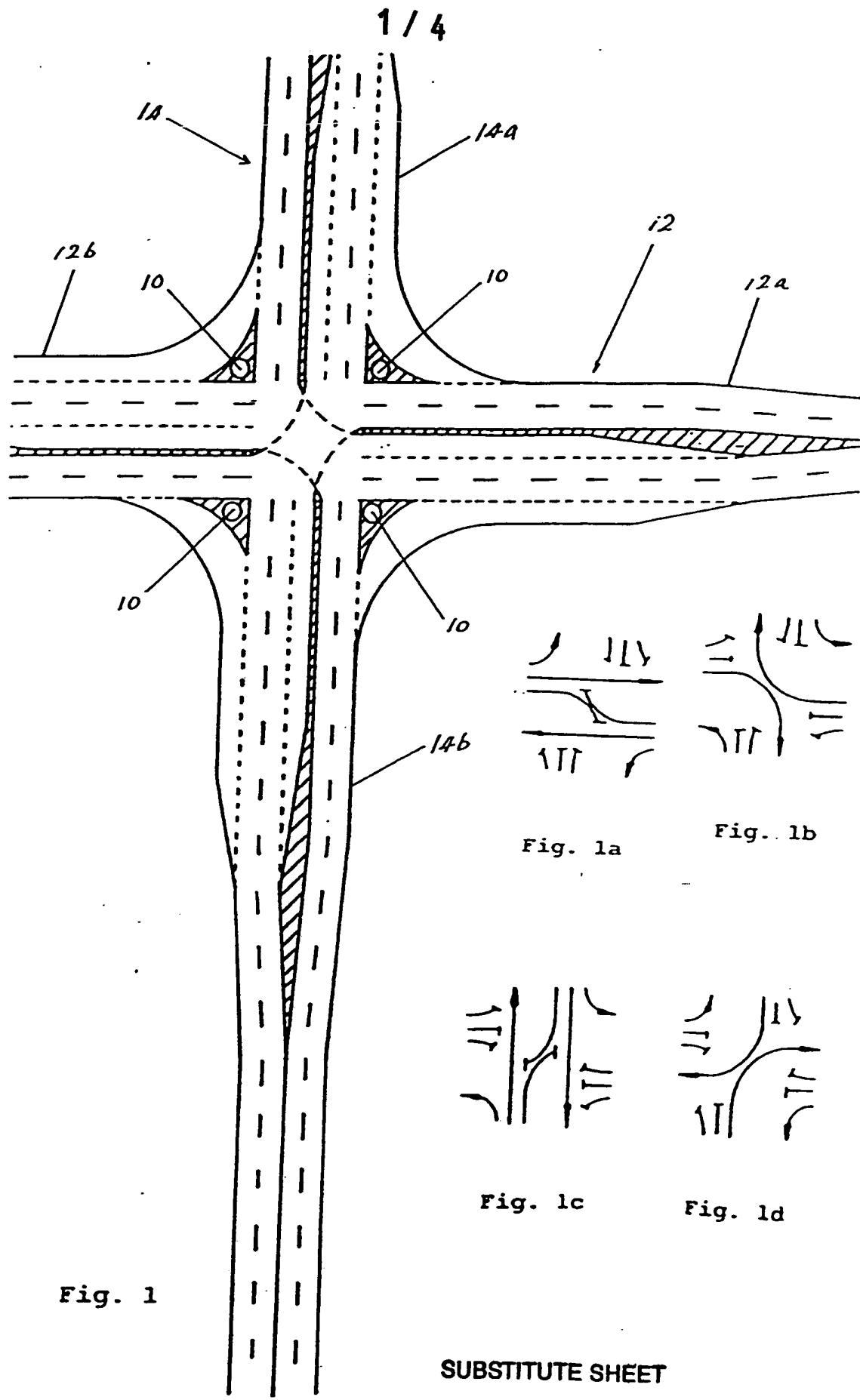


Fig. 1

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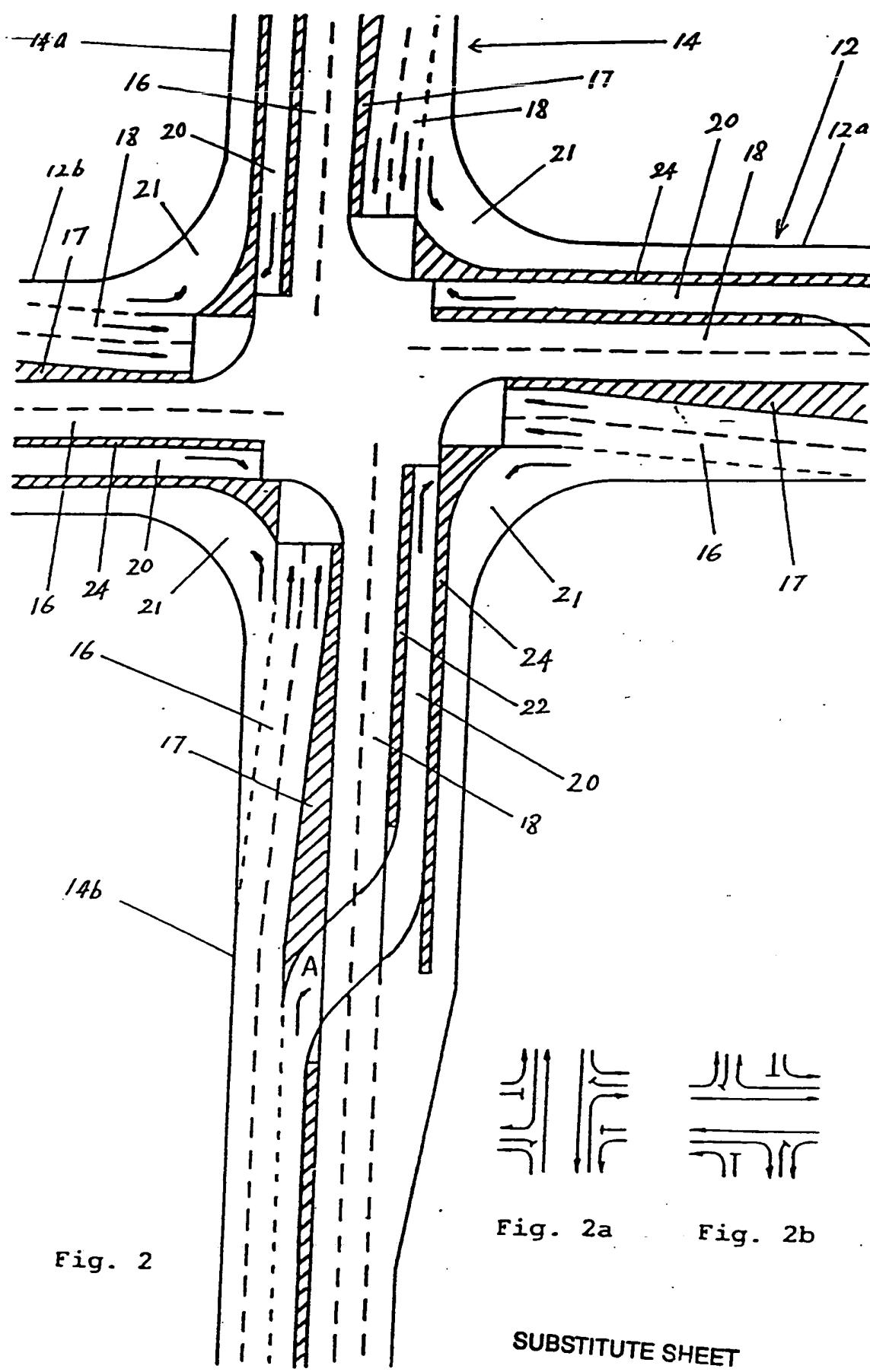


Fig. 2

Fig. 2a

Fig. 2b

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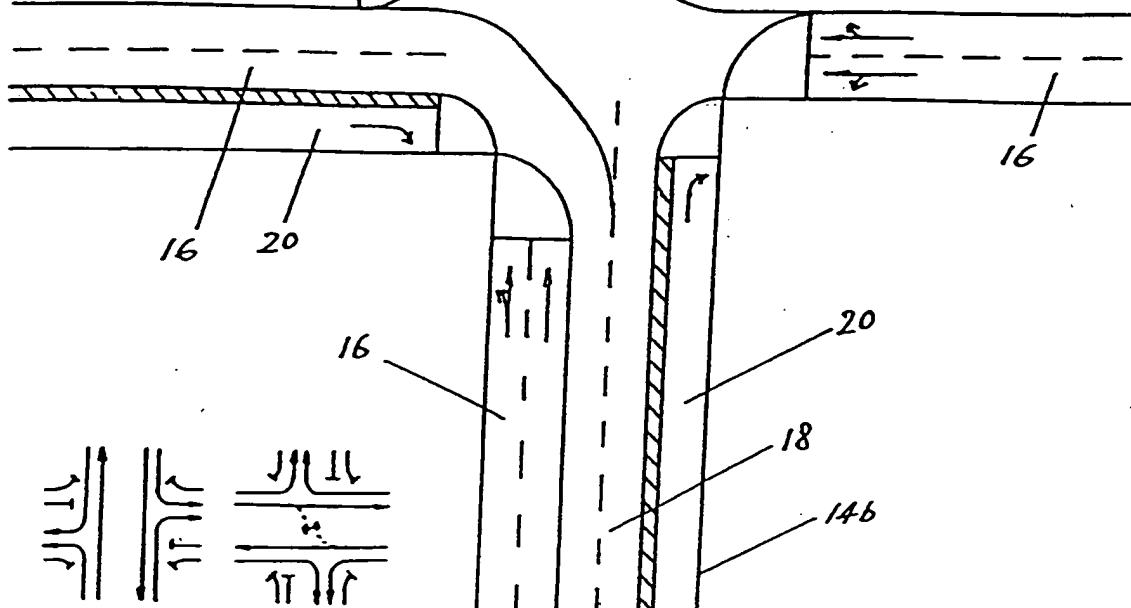
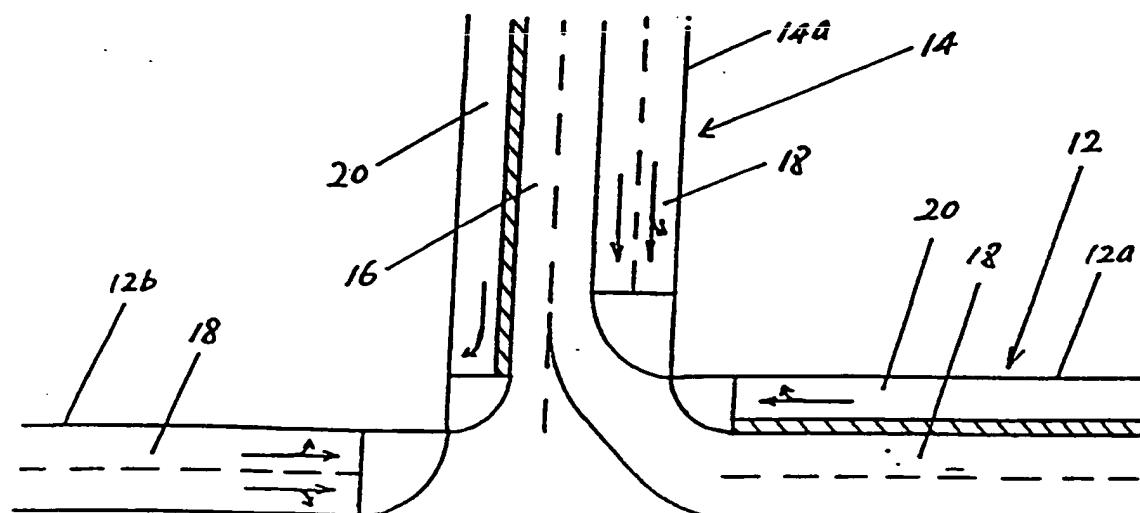


Fig. 3a Fig. 3b

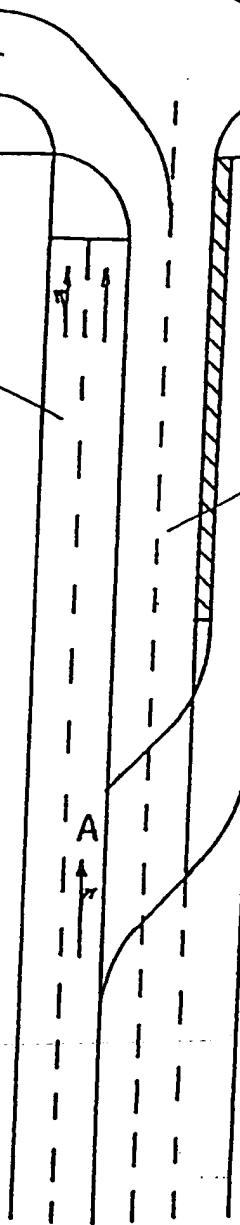
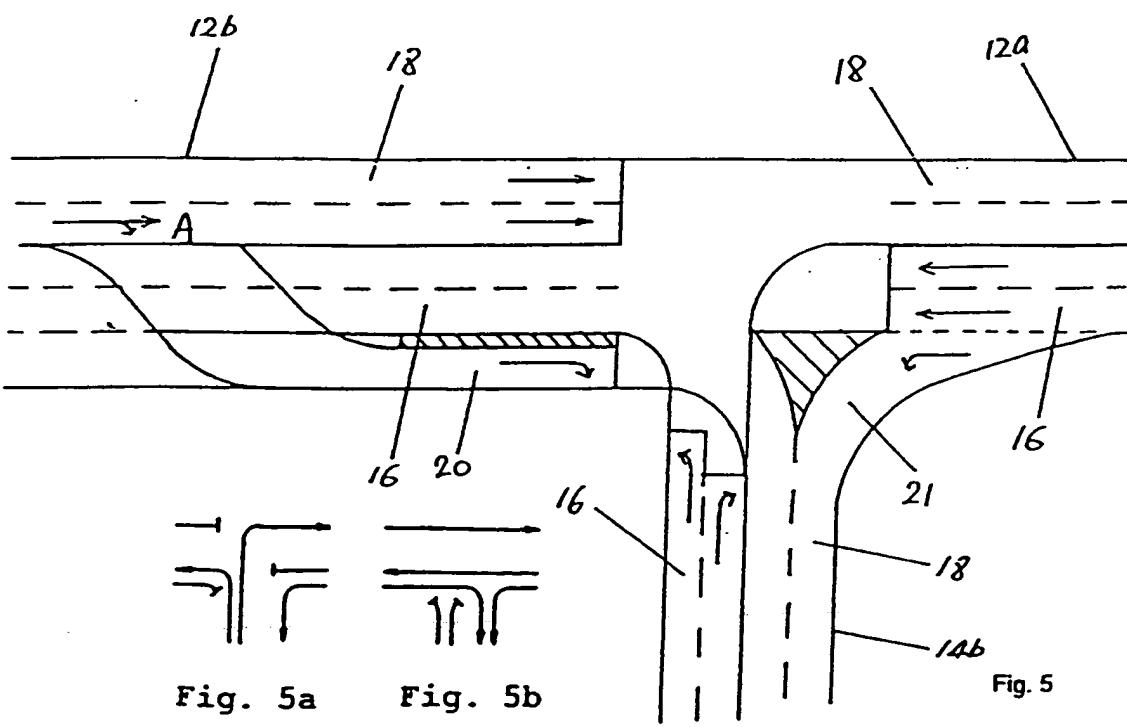
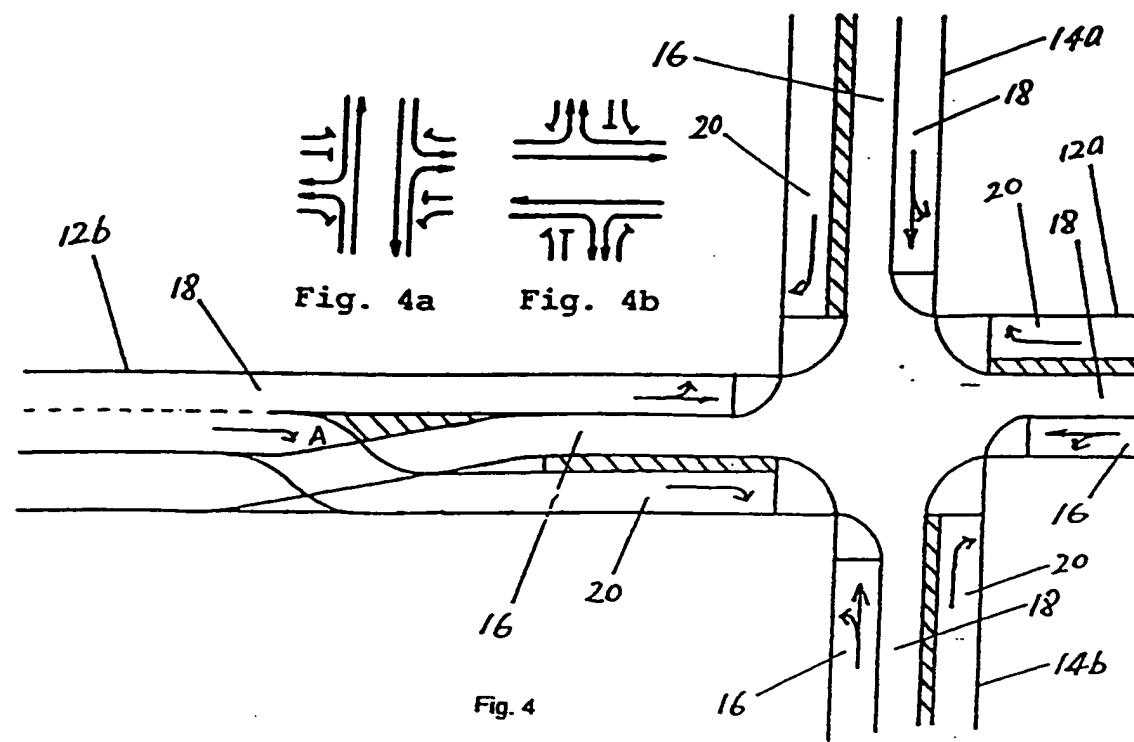


Fig. 3

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INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

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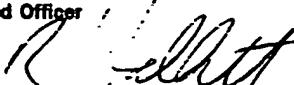
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate of the relevant passages ¹²	Relevant to Claim No ¹³
A	US,A, 3872422 (OBERMAIER et al.) 18 March 1975 (18.03.75) See abstract and figure 1.	
A	GB,A, 1246771 (OMRON TATEISI ELECTRONICS CO) 22 September 1971 (22.09.71) See page 1 line 89 - page 2 line 13 and figure 1.	
A	AU,B, 83325/75 (487567) (GULF & WESTERN INDUSTRIES INC) 27 January 1977 (27.01.77) See page 4 line 14 - page 5 line 16 and figure 1.	
A	GB,A, 1137137 (AUTOMATIC TELEPHONE & ELECTRIC CO. LTD) 18 December 1968 (18.12.68) See page 1 line 76 - page 2 line 19 and figure 1.	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search 28 May 1992 (28.05.92)	Date of Mailing of this International Search Report 2 June 1992 (02.06.92)
International Searching Authority AUSTRALIAN PATENT OFFICE	Signature of Authorized Officer  R. Hallett

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 92/00106

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member		
GB	1246771	DE 2006129 US 3688254	FR 2035366	JP 49019040
US	3872422	CH 558966	DE 2229284	NL 7307755
AU	83325/75	US 3902156		

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